

What is claimed is:

1. A method for changing a property of a layer-formed plastic part comprised of at least one plastic material, the method comprising:

providing an electromagnetic radiation source;

positioning the layer-formed plastic part within a potential exposure range of the electromagnetic radiation source;

determining an exposure of radiation from the electromagnetic radiation source operable to change a property of the layer-formed plastic part from an existing state to an altered state; and

exposing the layer-formed plastic part to the exposure of radiation to change the property to the altered state.

2. The method of Claim 1, wherein determining the exposure of radiation from the electromagnetic radiation source operable to change the property of the layer-formed plastic part from the existing state to the altered state includes:

recognizing the existing state of the property of the layer-formed part;

identifying a desired state of the property;

identifying the exposure of radiation to change the property of the layer-formed plastic part such that the altered state reaches the desired state.

3. The method of Claim 1, wherein the layer-formed plastic part is formed using at least one of selective laser sintering and fused deposition modeling.

4. The method of Claim 1, wherein the exposure of electromagnetic radiation is controlled by relative movement of the layer-formed plastic part and the electromagnetic radiation source.

5. The method of Claim 4, wherein the layer-formed plastic part is moved relative to the source of the electromagnetic radiation.

6. The method of Claim 4, wherein the source of the electromagnetic radiation is moved relative to the layer-formed plastic part.

7. The method of Claim 4, wherein the exposure of radiation is controlled by at least partially directing a discharge of radiation from the electromagnetic radiation source.



8. The method of Claim 7, wherein the exposure of radiation is controlled by manipulating at least one magnetic field through which the radiation from the electromagnetic radiation source will pass.

9. The method of Claim 1, wherein the exposure of radiation is controlled by selectively positioning a radiation-blocking shield between the layer-formed plastic part and the electromagnetic radiation source such that at least part of the layer-formed plastic part is shielded from the radiation source.

10. The method of Claim 1, wherein the property to be changed is one of physical strength, elongation, modulus, impact resistance, operating temperature range, heat capacity, flammability, conductance, and emittance.

11. The method of Claim 10, wherein the electromagnetic radiation source and the exposure of radiation are selected to at least one of cross-link and chain-scission molecules of the plastic material to change the property of the layer-formed plastic part to the desired state.

12. The method of Claim 1, wherein the electromagnetic radiation is provided by one of an electron beam, an ultraviolet light source, or a radioactive material.

13. The method of Claim 1, further comprising forming an additional layer upon the layer-formed plastic part after the exposure of radiation has been applied.

14. The method of Claim 13, further comprising exposing the additional layer to a secondary exposure of radiation.

15. A method for producing a layer-formed plastic part comprised of at least one plastic material, the method comprising:

forming at least one layer of a layer-formed plastic part;

determining an exposure of radiation from an electromagnetic radiation source operable to change a property of the layer from an existing state to an altered state;

exposing the layer to the exposure of radiation to change the property to the altered state; and

forming an additional layer of the layer-formed plastic part onto the previously-formed layer.



16. The method of Claim 15, wherein determining the exposure of radiation from the electromagnetic radiation source operable to change the property of the layer-formed plastic part from the existing state to the altered state includes:

- 5       recognizing the existing state of the property of the layer;
- identifying a desired state of the property;
- identifying the exposure of radiation to change the property of the layer such that the altered state reaches the desired state.

17. The method of Claim 15, wherein the layer-formed plastic part is formed using at least one of selective laser sintering and fused deposition modeling.

10       18. The method of Claim 15, further comprising exposing a plurality of layers of the layer-formed plastic part to exposures of radiation.

19. The method of Claim 18, further comprising varying the exposures of radiation to which the layers of the layer-formed plastic part to differently change the properties of respective layers.

15       20. The method of Claim 18, further comprising varying the electromagnetic radiation source to differently change the properties of respective layers.

21. The method of Claim 15, wherein the exposure of electromagnetic radiation is controlled by relative movement of the layer and the electromagnetic radiation source.

20       22. The method of Claim 21, wherein the layer is moved relative to the source of the electromagnetic radiation.

23. The method of Claim 21, wherein the source of the electromagnetic radiation is moved relative to the layer.

24. The method of Claim 15, wherein the exposure of radiation is controlled by targeting discharge of radiation from the electromagnetic radiation source.

25       25. The method of Claim 24, wherein the exposure of radiation is controlled by manipulating at least one magnetic field.

26. The method of Claim 15, wherein the exposure of radiation is controlled by selectively positioning a radiation-blocking shield between the layer-formed plastic part and



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the electromagnetic radiation source such that at least part of the layer-formed plastic part is shielded from the radiation source.

27. The method of Claim 15, wherein the property to be changed is one of physical strength, elongation, modulus, impact resistance, operating temperature range, heat capacity, flammability, conductance, and emittance.

28. The method of Claim 27, wherein the electromagnetic radiation source and the exposure of radiation are selected to at least one of cross-link or chain-scission molecules of the plastic material to change the property of the layer-formed plastic part to the desired state.

29. The method of Claim 15, wherein the electromagnetic radiation is provided by one of an electron beam, an ultraviolet light source, or a radioactive material.

30. A system for changing a property of a layer-formed plastic part comprised of at least one plastic material, the system comprising:

an electromagnetic radiation source;

a part presentation device configured to receive the layer-formed plastic part and present the layer-formed plastic part to the electromagnetic radiation source; and

an exposure control device operably coupled with at least one of the electromagnetic radiation source and the part presentation device, the exposure control device being configured to selectively expose the layer-formed plastic part to an exposure of radiation generated by the electromagnetic radiation source.

31. The system of Claim 30, wherein the layer-formed plastic part is formed using at least one of selective laser sintering and fused deposition modeling.

32. The system of Claim 30, wherein the exposure control device selectively exposes the layer-formed plastic part to the electromagnetic radiation source by moving at least one of the part presentation device and the electromagnetic radiation source.

33. The system of Claim 30, further comprising a radiation directing device configured to direct a discharge of radiation from the electromagnetic radiation source.



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34. The system of Claim 33, wherein the radiation directing device includes a magnetic channeling system configured to direct the discharge of radiation by manipulating a magnetic field.

5 35. The system of Claim 30, further comprising a radiation-blocking shield configured to be positioned between the layer-formed plastic part and the electromagnetic radiation source such that at least part of the layer-formed plastic part is shielded from the radiation source.

10 36. The system of Claim 30, wherein the property to be changed is one of physical strength, elongation, modulus, impact resistance, operating temperature range, heat capacity, flammability, conductance, and emittance.

37. The method of Claim 36, wherein the electromagnetic radiation source and the exposure of radiation are selected to at least one of cross-link and chain-scission molecules of the plastic material to change the property of the layer-formed plastic part to the desired state.

15 38. The system of Claim 30, wherein the electromagnetic radiation source is one of an electron beam, an ultraviolet light source, or a radioactive material.

20 39. The system of Claim 30, further comprising a layering production system operable to create the layer-formed plastic part such that a layer of the layer-formed plastic part is selectively exposed to the exposure of radiation then an additional layer is formed upon the layer-formed plastic part such that the additional layer is not subjected to the exposure of radiation.

40. A system for producing a layer-formed plastic part comprised of at least one plastic material, the method comprising:

- 25 a layer-forming production device configured to produce the layer-formed plastic part by forming at least one layer of plastic material;
  - an electromagnetic radiation source;
  - a part presentation device configured to receive the layer-formed plastic part and present the layer-formed plastic part to the electromagnetic radiation source;
  - an exposure control device operably coupled with at least one of the electromagnetic radiation source and the part presentation device, the exposure control device being configured to selectively expose the at least one
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layer of the layer-formed plastic part to an exposure of radiation generated by the electromagnetic radiation source; and  
a control unit operably coupled with the layer-forming production device and the exposure control device, the control unit being configured to selectively direct the at least one layer to be exposed to the exposure of radiation after the forming of the at least one layer.

41. The system of Claim 40, wherein the layer-forming production device produces the layer-formed plastic part using at least one of selective laser sintering and fused deposition modeling.

42. The system of Claim 40, wherein the exposure control device selectively exposes the layer-formed plastic part to the electromagnetic radiation source by moving at least one of the part presentation device and the electromagnetic radiation source.

43. The system of Claim 40, further comprising a radiation directing device configured to direct a discharge of radiation from the electromagnetic radiation source.

44. The system of Claim 43, wherein the radiation directing device includes a magnetic channeling system configured to direct the discharge of radiation by manipulating a magnetic field.

45. The system of Claim 40, further comprising a radiation-blocking shield configured to be positioned between the layer-formed plastic part and the electromagnetic radiation source such that at least part of the layer-formed plastic part is shielded from the radiation source.

46. The system of Claim 40, wherein the property to be changed is one of physical strength, elongation, modulus, impact resistance, operating temperature range, heat capacity, flammability, conductance, and emittance.

47. The method of Claim 46, wherein the electromagnetic radiation source and the exposure of radiation are selected to at least one of cross-link or chain-scission molecules of the plastic material to change the property of the layer-formed plastic part to the desired state.

48. The system of Claim 40, wherein the electromagnetic radiation source is one of an electron beam, an ultraviolet light source, or a radioactive material.

